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News

Mineral Physics Machines

The field of mineral physics will benefit from an era of big physics machines that will produce intense beams of X rays, neutrons, and high-energy particles. The new super accelerators are being built as tools for high-energy physics experiments and for materials science research.

Mineral physics studies are among the most sophisticated to be conducted. High-intensity X rays will be used to solve complex crystal structures, to detail the steps of fast mineral phase changes, and to penetrate to the sample chambers of high-pressure cells. Neutron beams powerful enough to penetrate surface layers of the earth's crust will be used to probe for mineral deposits.

Notable among the machines of this forthcoming era are the new synchrotrons and the "Desertron," a device so large it requires large, wide-open spaces. The new machines have recently received strong votes of support by the Department of Energy panels and by Congressional Committees, but only after stirring considerable controversy [see *Eos*, January 3, 1984, p. 1, for a report on the controversy surrounding academic science lobbying].

Evidently a lot is at stake for the United States in the world of high-energy particle studies. The superconducting Super Collider (SSC), or Desertron, has evolved at the expense of the Isabelle superconducting proton-proton collider (officially, Colliding Beam Accelerator), which has been under construction at the Brookhaven National Laboratory since 1978 at a cost of over $200 million. Isabelle, which had been plagued with design problems, is now considered obsolete even though it has not been completed. Isabelle would have had a ring diameter of 3.8 km (actually already constructed). The SSC may have a ring diameter on the order of 160 km.

An example of a newly proposed and politically controversial accelerator that will have mineral physics applications is the new synchrotron light source at the National Center for Advanced Materials (NCAM) at the Lawrence Berkeley Laboratory in California. The synchrotron as originally planned was to be built as a central part of a large, materials science research and development laboratory. Controversy has resulted from the suddenness with which the project and its funding were announced in early 1983. The entire cost was announced as $84 million, to be spread over 5 years. No peer review or competitive structure was employed by the Office of Management and Budget, and broad criticism has been voiced. The result has been that the synchrotron has been detailed for separate consideration and review by a special panel put together by the Department of Energy from which the funds are to be derived.

The concept of having research laboratories located next to (actually attached to) a synchrotron light source has a lot to be said for it. The synchrotron X ray beams in such demand for diffraction, fluorescence, line fine structure, and other physical measurements of minerals and other materials are only available to an investigator for short periods requiring advance notice. One to three days of beam-time per year is about the maximum currently available. For protection from the intense radiation, all experiments and measurements must be done by remote control, and thus an investigator must be prepared to spend time simply setting up for alignment and other premeasurements. Location of materials laboratories in close proximity to a synchrotron is unusually advantageous.—*PMB*

CO_2 Pulses

Studies of the sources and the increases of carbon dioxide in the atmosphere have been both frustrating and alarming; frustrating because so little is known and alarming because the potential consequences could be so grave (*Eos*, November 15, 1983, p. 929). The nature of the complexities have recently been focused upon by studies of the carbon cycle at the earth's surface and its influence on the atmosphere. It turns out that most of the increases of atmospheric carbon dioxide are from two sources: (1) petroleum and coal use and (2) the clearing of major forested lands.

It is generally acknowledged that fossil fuel use has declined sharply during the past several years and that the deforestation of large areas under development will end. A recent review of current thinking on the effects of global deforestation by G. M. Woodwell and others stated that, "appropriate action taken now might reduce or eliminate the problem. Stabilization of the rate of combustion of fossil fuels combined with a program of reforestation would contribute toward stabilizing the CO_2 content of the atmosphere . . . we need not accept as inexorable a global warming due to the accumulation of CO_2 in the atmosphere" (*Science*, *222*, 1081–1086, 1983).

The conclusions may be correct, but the factors affecting the release of carbon dioxide into the atmosphere are complex. The levels of carbon dioxide in the atmosphere vary, following major seasonal pulses. In the northern hemisphere, spring and summer levels are lower than the average due to the uptake of plants in their growing cycle. The fall and winter seasons experience a major pulse of carbon dioxide from decaying leaves and plants. Superimposed on these pulses are changes such as those related to the rates of fossil fuel combustion and to a long list of natural seasonal phenomena.

To solve the problems of analyzing carbon dioxide effects, the natural CO_2 levels and trends in changes of those levels must first be established. It is necessary to obtain estimates of historic levels of carbon dioxide in the atmosphere, and to determine increases relative to some base. According to the report by Woodwell et al., "The increase in the CO_2 content of the atmosphere over the 120 years since 1860 exceeds 15 percent; it may be as much as 30 percent." And a report about the carbon cycle by R. A. Kerr, concluded that, "The ultimate aim of carbon cycle research is to predict how the concentration of carbon dioxide in the atmosphere will vary as humankind pumps more and more of it into the atmosphere . . . None of these models yet duplicates the present well enough to attempt predicting the future" (*Science*, *222*, 1107–1108, 1983).

Among the many factors being considered in carbon dioxide/atmospheric studies, several points are noted. One is that deforestation will not be a problem if its rate continues. Forests will have disappeared by the first half of the 21st century. This might be considered an example of a change of critical factor, as would the start of reforestation. Other examples include saturation of carbon dioxide in the oceans and release of carbon dioxide from the earth's surface due to global warming. In each case, a contributing factor would suddenly cease to exist.

The interactions of the many factors affecting carbon dioxide levels are hard to decipher, but the reasons for attempting it are clear. Woodwell et al. state: "Recent rates of accumulation of CO_2 have been high enough to produce, if continued . . . approximately twice the amount thought to have been present in 1900." Very soon, therefore, global warming trends that could cause the shift of climatic zones, the displacement of agriculture, the disruption of major vegetation zones, and the rise of sea level by 5 m could occur.—*PMB*

OTA Congressional Fellowship

The Office of Technology Assessment (OTA) is seeking qualified candidates from academia, industry, and government for its Congresional Fellowship Program for 1984–1985. The program, similar to AGU's Congressional Fellowship Program, provides an opportunity for individuals who have demonstrated outstanding ability to gain a better understanding of science and technology issues facing Congress and the ways in which Congress establishes national policy related to these issues.

OTA will select up to six fellows for a 1-year program, to begin September 1984 on Capitol Hill. The fellowship is open to men and women of all disciplines who have demonstrated exceptional competency in the physical or biological sciences, engineering, law, economics, environmental and social sciences, or public policy. Candidates must have completed research and training at the doctoral level or have equivalent experience, as judged by the OTA selection committee. Salaries for successful candidates will range from $25,000 to $41,000 per year, based on the fellow's current salary and/or training and experience.

Fellowship applicants are required to submit a resume (up to two pages) that lists education, experience, area(s) of special interest; a one-page list of published works; three letters of reference; and a statement of roughly 1000 words addressing the applicant's principal expectations of the fellowship program and expected contributions to OTA during the program. For additional information, write to Congressional Fellowships, Personnel Office, Office of Technology Assessment, Congress of the United States, Washington, DC 20510. Applications for the fellowship and letters of reference should be sent to the above address no later than February 3, 1984. Letters of recommendation should be sent directly to OTA.—*BTR*

In Congress

USGS Budget Set

In fiscal 1984, the U.S. Geological Survey (USGS) is budgeted for a 2.3% increase in funding over fiscal 1983. Although the fiscal year began on October 1, the Department of Interior appropriations bill, which includes the USGS budget, was not signed into law until nearly a month later. Here is a summary of the program-level funding for the USGS. The program level represents the actual money—including money from the federal treasury, residual funds, transfers, etc.—available.

Table 1 compares USGS funding for fiscal 1983, the Reagan request for fiscal 1984, and the final fiscal 1984 program levels based on the conference completed on September 29 between the House and Senate appropriations committees. The USGS is budgeted for $405.9 million in fiscal 1984, including $24 million in residual funds for the National Petroleum Reserve in Alaska (NPRA).

Some differences between 1983 and 1984 funding for the activities and subactivities reflect changes in categorization of programs that accompanied recent budget streamlining. Nevertheless, the fiscal 1984 budget mirrors some internal refocusing of priorities. For example, there is an 11% increase in fiscal 1984 for both the water resources investigations activity (with the federal program of the national water data system getting a 23% boost) and for the National Mapping Program. The offshore geologic surveys subactivity will receive a 20% increase and the mineral resource surveys subactivity has gotten better than a 9% boost. Designated for decreases are the subactivities for energy hydrology (down 21%) and energy geologic surveys (down 12%).

The USGS budget is part of the Department of Interior appropriations bill (H.R. 3363), which was signed into law by President Reagan on November 4.—*BTR*

TABLE 1. USGS Fiscal 1984 Budget Status, Program Levels, in Millions of Dollars

Activity	FY 1983	Reagan FY 1984 Proposal[1]	Final Conference FY 1984[2]
Geologic and Mineral Resource Surveys			
Geological hazards	51.6	40.7	51.4
Land resource surveys	16.8	16.7	17.2
Mineral resource surveys	41.1	45.3	44.9
Energy geologic surveys	34.2	25.5	30.1
Offshore geologic surveys	15.5	13.7	18.6
Subtotal	**159.2**	**141.9**	**162.2**
Water Resources Investigations			
National water data system: federal program	51.2	55.4	66.6
National water data system: federal-state cooperative program	15.8	47.1	49.1
Energy hydrology	15.1	9.6	11.9
Subtotal	**115.1**	**112.1**	**127.6**
National Mapping Program	81.1	77.9	90.1
Facilities	9.0	13.2	10.4
General Administration	14.9	14.2	15.5
Total, USGS	396.9[3]	365.5[4]	405.9[5]

Source: USGS. Numbers may not total because of rounding.
[1]See *Eos*, February 15, 1983, p. 65.
[2]Signed into law (P.L. 98-146) on November 4. Based on a conference completed September 29 between the House and Senate appropriations committees. See *Eos*, September 13, 1983, p. 548.
[3]Includes $11.1 million for earth science applications, which was a separate activity in fiscal 1983. It now falls into the surveys and investigations activities. Total also includes $5.4 million for the Barrow area gas program.
[4]Does not include monies for National Petroleum Reserve in Alaska (NPRA). Total also includes $6 million for digital cartography, which had previously been included with National Mapping Program.
[5]Includes $24 million from residual funds for NPRA.

WaterWatch

WaterWatch
News of the hydrology section.

Editor: Mary P. Anderson, Department of Geology and Geophysics, University of Wisconsin–Madison, Madison, WI 53706 (608-262-2396).

Welcome to WaterWatch

The President's Views on Accreditation of Hydrologists

With this issue we inaugurate WaterWatch, which is intended to bring news of water and of AGU's Hydrology Section to all readers of *Eos* at least every 3 months. One member of each of the Hydrology Section's technical committees is serving as a topical reporter, feeding information to Mary Anderson, editor of *Eos* for hydrology, but that is not enough. Quarterly publication of a substantial feature will require the active participation of many more. I appeal to all members of the Hydrology Section to provide Mary Anderson with newsworthy items.

As Section President I plan to use WaterWatch as my primary means of communicating with the membership. Let me begin now with a brief statement on an issue of considerable interest to many of us, the accreditation of professional hydrologists and professional hydrogeologists.

As most of you know there is an active movement to create a mechanism for accreditation of hydrogeologists. The motivation for this movement appears to be twofold: (1) protection of the public from unqualified practitioners, and (2) certification of the qualifications to practice of those whose hydrologic training does not match the requirements for registration as a Professional Engineer or as a Professional Geologist. Both motivations are laudable, but both stem from the needs of professional practice while the American Geophysical Union is a research organization. For this reason the Section Executive Committee decided (*Eos*, September 13, 1983, p. 554; December 27, 1983, p. 1005) not to involve the AGU in this certification movement, feeling that this is more properly a role for an organization such as the American Society of Civil Engineers. At the same time we urge each member to decide individually whether or not to participate.

While this decision may seem arbitrary to many, particularly to those members whose interests lie primarily in the application rather than the creation of hydrologic knowledge, it is consistent with the efforts of the last several years on the part of the AGU Hydrology Section leadership to improve the image and status of hydrology among our colleagues from the other sections of the Union. Many of the important geophysical problems of tomorrow will require active cooperation of earth scientists from many sections of AGU (I think immediately of the question of climate variability) and to handle these problems together will require a firm basis of mutual scientific respect. Building this respect for hydrology, through the AGU journal *Water Resources Research*, through the nature and quality of our technical sessions, and through gaining Union recognition for our most distinguished members, continues to be my primary goal as your President.

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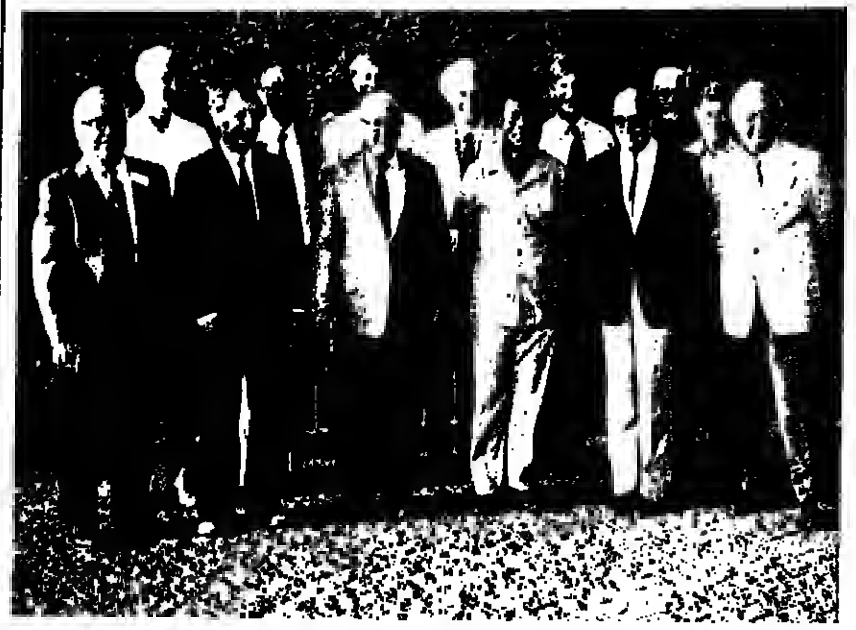
(cont. on p. 10)



International Association of Hydrological Sciences Officers for 1983–1987 The following officers of IAHS are shown shortly after their election at Hamburg, Federal Republic of Germany, on August 26, 1983. **Front row, left to right:** A. Ivan Johnson, *President, International Committee on Remote Sensing and Data Transmission (USA)*; G. Matthess, *President, International Commission on Water Quality (FRG)*; Mark F. Meier, *Immediate Past President, IAHS (USA)*; N. B. Ayibotele, *Third Vice President, IAHS (Ghana)*; G. Kovacs, *President, IAHS (Hungary)*; L. Lliboutry, *President, International Commission on Snow and Ice (France)*. **Back row, left to right:** T. O'Donnell, *Editor, IAHS (UK)*; I. Rodriguez-Iturbe, *First Vice President, IAHS (Venezuela)*; H. Lieberhut *(FRG)*; V. M. Kotliakov, *Second Vice President, IAHS (USSR)*; M. Hamlin, *President, International Commission on Water Resource Systems (UK)*; H. C. Riggs, *Treasurer, IAHS (USA)*; H. J. Luhrdmandler, *President, International Commission on Groundwater (Netherlands)*. Not present for the photo was J. C. Rodda, Secretary General, IAHS (UK).

(cont. from p. 9)

earth scientists from many sections of AGU (I think immediately of the question of climate variability) and to handle these problems together will require a firm basis of mutual scientific respect. Building this respect for hydrology, through the AGU journal *Water Resources Research*, through the nature and quality of our technical sessions, and through gaining Union recognition for our most distinguished members, continues to be my primary goal as your President. I welcome your comments on this position.

Peter S. Eagleson
President
AGU Hydrology Section

Reporters for WaterWatch

Erosion and Sedimentation: Karen Prestegaard, Franklin and Marshall College, Dept. of Geology, Box 3003, Lancaster, PA 17604 (717-291-4134)

Remote Sensing: Thomas J. Jackson, USDA, Beltsville Agricultural Research Center, Beltsville, MD 20705 (301-344-4490)

Water Quality: Charles E. Chamberlin, Dept. of Geography and Environmental Engineering, Johns Hopkins University, Baltimore, MD 21218 (301-338-7109)

Groundwater: Jack Robertson, USGS, EGS Mail Stop 410, Reston, VA 22092 (703-860-6976)

International Reporter: A. Ivan Johnson, 7474 Upham Court, Arvada, CO 80003 (303-425-5610)

Precipitation: Vijay K. Gupta, Dept. of Civil Engineering, Univ. of Mississippi, University, MS 38677 (601-232-5366)

Surface Runoff: Keith Hipel, Dept. of Systems Design Engineering, Univ. of Waterloo, Waterloo, Ontario, Canada N2L 3G1 (519-885-1211, ext. 3113)

For urban hydrology: Marshall Jennings, USGS, Gulf Coast Hydraulics Lab, NSTL Station, MS 39529 (601-688-3508)

Soil Water: Hubert Morel-Seytoux, Engineering Research Center, Colorado State Univ., Fort Collins, CO 80523 (303-491-8749)

Snow and Ice: Jeff Dozier, Dept. of Geography, Univ. of California, Santa Barbara, CA 93106 (805-961-2309 or 3663)

History and Heritage: Edward R. Landa, USGS, MS, Mail Stop 424, Reston, VA 22092 (703-860-6834)

all members of AGU with interests in this area are invited to participate in the shaping of its philosophy and activities. Possible committee activities already identified include:

- sponsoring symposia and publications (a half-day symposium on the history of hydrology is tentatively scheduled for the 1984 AGU Fall Meeting)
- encouraging the collection of contemporary historical materials (including oral histories) and the preservation of old data and instruments
- facilitating contacts between hydrologists and historians/archivists to promote interest and awareness of the discipline among such persons.

Close ties with the Geological Society of America's History of Geology Division and the newly formed History of Earth Sciences Society are anticipated. Individuals interested in participating in the committee's activities are encouraged to contact the chairperson: William Back, U.S. Geological Survey, WRD, Mail Stop 431, National Center, Reston, VA 22092 (tel.: 703-860-6951).

Urban Hydrology and Surface Runoff

The Urban Hydrology Committee was recently amalgamated with the Surface Runoff Committee (*Eos*, September 13, 1983, p. 554). The chairman of the Surface Runoff Committee is Keith Hipel, Department of Systems Design Engineering, University of Waterloo, Waterloo, Ontario, Canada N2L 3G1, 519-885-1211, ext. 3113. The members of the Surface Runoff Committee warmly welcome their new colleagues from Urban Hydrology.

Three special sessions are being planned for the 1984 AGU meetings. Peter Germann is organizing a session on "Hillslope Hydrology" for the Spring Meeting, and for the Fall Meeting, Dave Furelich and Upmanu Lall are planning sessions on "Paleohydrology" and "Dam Safety," respectively. The Surface Runoff Committee would greatly appreciate any suggestions that other people may have about future activities in surface runoff and urban hydrology. Kindly feel free to directly contact any member of the committee.

News & Announcements

History and Heritage Committee

The past few years have seen a burst of interest in discipline-specific history within the scientific community. Within the Hydrology Section during the past year such interest has resulted in the formation of a History and Heritage Committee. This committee will function as a subgroup of AGU's Committee on the History of Geophysics, which was established in 1981. The History and Heritage Committee is still in the embryonic stage, and

The principal investigators are now in the process of constructing the wellfield modifications required to initiate actual field studies. Theoretical work performed during the past 9 months will form the basis for designing a series of tracer tests which will be initiated in late 1983 or early 1984. Manuscripts describing the theoretical background for the project have been submitted to *Water Resources Research* and to *Ground Water*. In addition to principal investigators Fred J. Molz, Oktay Güven, and Joel G. Melville of Auburn's Civil Engineering Department and supporting staff, the project will employ a co-principal investigator, two field engineers, and three graduate students.

This news item contributed by Fred L. Molz, *Engineering Experiment Station, Auburn University, AL 36849.*

Kisiel Lectures

The Department of Hydrology and Water Resources at the University of Arizona has instituted a series of lectures to perpetuate the memory of Chester C. Kisiel. The first lecture, "Reflections on Hydrology," was delivered on March 2, 1982, by Nicholas C. Matalas of the U.S. Geological Survey. The text of the lecture has been published as a 16-page booklet and is available at $3 per copy from the Department of Hydrology and Water Resources, University of Arizona, Tucson, AZ 86521. The second lecture in the series was delivered in March 1983 by Myron B Fiering of Harvard University and its text is now being prepared for publication. The third lecture in the series, by John Bredehoeft of the U.S. Geological Survey, Menlo Park, is scheduled for February 23, 1984, in Tucson.

This news item was contributed by Nathan Buras, *Department of Hydrology and Water Resources, University of Arizona, Tucson, AZ 86521.*

Meetings

Hydrology Days

The fourth annual AGU Front Range Branch Hydrology Days will be held April 24–26, 1984, at Colorado State University, Fort Collins. Special sessions are planned on "Hydrology of the Vadose Zone" and "Surface and Groundwater Models Suited for Management of Aquifers and of Stream Aquifer Systems" (*Eos*, November 22, 1983, p. 950). Deadline for submission of abstracts is February 21, 1984. Contact H. J. Morel-Seytoux, Department of Civil Engineering, Colorado State University, Fort Collins, CO 80523 (tel.: 303-491-5448 or -8549).

The third annual AGU Front Range Branch Hydrology Days took place April 19–21, 1983. It was attended by 101 students and 39 professionals; 12 students presented papers in the M.S. and Ph.D. categories. Awards were provided for the best student paper presentation in each category, and all students presenting papers received complimentary books and complimentary student membership in AGU. There was no registration fee for students.

R. Allan Freeze, President-Elect of AGU's Hydrology Section, delivered the keynote address, entitled "Rainfall-Runoff: Scientific Enquiry and Engineering Prediction." Jeris Danielson, State Engineer, presented the first Hydrology Days award for outstanding contributions to Hydrology to Professor Emeritus Robert E. Glover.

Members of the organizing committee were H. J. Morel-Seytoux, chairman; H. S. Boyne, D. G. Decoursey, A. Klute, T. B. McKee, F. M. Smith, D. K. Sunada, and J. W. Warner. Several private firms contributed to the costs of the conference: Ott Water Engineers of Denver; Simons, Li and Associates of Fort Collins; Water Resources Consultants of Denver; Engineering Hydraulics of Longmont; and Hydro-Triad of Lakewood.

Dispersion in Groundwater

On June 1, 1983, the U.S. Environmental Protection Agency (EPA) and Auburn University agreed on a joint project to study how pollutants spread in groundwater. This project is part of a large, ongoing, groundwater research program administered by EPA's Robert S. Kerr Environmental Research Laboratory located in Ada, Oklahoma. At Auburn University the contract is administered by the Water Resources Institute.

The research is entitled "Experimental and Theoretical Studies of Contaminant Dispersion in Groundwater." Much of the planned work will center around the performance of a large field experiment at Auburn University's Mobile Field Test Facility. This facility was established over the past decade and now contains 40 water supply, injection, and observation wells. The Mobile site has been in operation since 1975 and the work performed there, related to thermal energy storage in aquifers, is well known.

Groundwater Geochemistry

A Canadian-American Conference on "Practical Applications of Groundwater Geochemistry," to be held June 22–26, 1984, will be presented jointly by the Alberta Research Council and The National Water Well Association at the Banff Springs Hotel. Speakers will include J. Toth, D. Langmuir, Y. Kharaka, N. Plummer, P. Fritz, B. Hitchon, E. Wallick, M. Trudell, and R. Knapp. Contributed papers are invited. For more information contact: Ed Wallick, Alberta Research Council, 6th Floor, Terrace Plaza, 4445 Calgary Trail South, Edmonton, Alberta, Canada T6H 5R7.

1984 AGU Spring Meeting

Sedimentation Committee

A special session on "Sediment Storage in Rivers and Estuaries" will be held at the AGU Spring Meeting in Cincinnati (*Eos*, November 22, 1983, p. 950). For information, contact Karen Prestegaard, Department of Geology, Franklin and Marshall College, Box 3003, Lancaster, PA 17604.

Groundwater Committee

The Groundwater Committee is sponsoring two symposia for the Spring Meeting (*Eos*, November 22, 1983, p. 950). A symposium on "Miscible and Immiscible Transport in Groundwater" is being organized by James W. Mercer, GeoTrans, Inc., P.O. Box 2550, Reston, VA 22090 (703-435-4400) and Leonard F. Konikow, U.S. Geological Survey, 431 National Center, Reston, VA 22092 (703-860-6892). A related symposium on "Field Methods for Supporting Chemical Transport Models" is being organized by Fred J. Molz, Civil Engineering Department, Auburn University, AL 36849 (205-826-4326) and Mary P. Anderson, Department of Geology and Geophysics, University of Wisconsin–Madison, Madison, WI 53706 (608-262-2396). Abstracts for either symposia should be sent to the organizers before February 6, 1984.

Surface Runoff Committee

A special session on "Hillslope Hydrology" is planned for the Spring Meeting. More information can be obtained from Peter Germann, Department of Environmental Sciences, University of Virginia, Charlottesville, VA 22903 (804-924-0558).

Hazardous Waste

The 80th Anniversary Meeting of the Association of American Geographers (1710 16th St., N.W., Washington, DC 20009, 202-234-1450) will be held in Washington, D. C., April 22–25, 1984. There will be a session on "Public Policy of Siting Hazardous Waste Facilities," which will include papers on groundwater problems.

Forest Uses

IUFRO, the International Union Forest Research Organization is sponsoring a conference on the Effects of Forest Uses on Erosion and Slope stability, to be held May 7–11, 1984, at the Environment and Policy Institute, E-W Center, University of Hawaii, Honolulu. For information, contact Ray Rice, IUFRO Symposium, Redwood Science Institute, 1700 Bayview, Arcata, CA 95521.

Erosion and Disasters

An international symposium on erosion, debris, flows, and disasters will be held September 3–5, 1985, in Tsukuba, Japan, and is sponsored by the Erosion Control Engineering Society of Japan. Information can be obtained from S. Kobashi, Organizing Secretary, ISWDD 1985, Department of Forestry, Kyoto University, Kyoto 606, Japan. Topics include: sediment transport phenomena, soil erosion, debris flows, landslides and other phenomena, and disasters and prevention measures.

Sedimentation-Related Meetings

The sedimentation committee would like to provide information on several meetings that took place in October 1983.

Geomorphological Field Group

The second annual meeting of the American Geomorphological Field Group was organized by S. Wells and T. Gardner and held in Chaco Canyon, N. Mex., October 7–10. Field excursions included visits to instrumented watersheds in badland areas, examination of the Quaternary history of Chaco Canyon, and investigation of fluvial problems associated with uranium mine tailings disposal and coal reclamation.

The AGFG is primarily an organization that seeks to promote discussion of field projects, but it also holds one day of technical sessions. Papers in the technical sessions cover a range of topics on hillslope and fluvial processes. Those interested in the AGFG and its future field excursions can get on the mailing list by contacting L. B. Leopold, AGFG, Department of Geology and Geophysics, University of California, Berkeley, CA 94720.

River Meandering

The American Society of Civil Engineers and the International Association for Hydraulic research held a specialty conference on river meandering in New Orleans, La., October 24–26, 1983. Papers were presented on the geomorphology of river meanders, engineering analysis, human impact on meandering rivers, and mathematical and physical modeling of meandering. Additional information about the presentations can be obtained from J. E. Glover, P.O. Box 631, Vicksburg, MS 39180.

Classified

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EOS

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The Weekly Newspaper of Geophysics

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Cover. A 750-m diameter circular moraine viewed from a helicopter flying over the Transantarctic Range, Victoria Land, Antarctica (77°14'S, 162°3'E). The moraine encloses masses of ice and snow that have fallen from the tip of the Ringer Glacier, a retreating, hanging structure. The moraine lies on the Miller Glacier, the surface of which is deeply scored by subparallel ablation troughs attributed to the action of windblown dust. The view is toward the southwestern wall of the valley that contains the Miller Glacier. (Photo made and contributed by Ursula B. Marvin, Center for Astrophysics, 60 Garden St., Cambridge, MA 02138.)

POSITIONS AVAILABLE

University of Arizona/Postdoctoral Research Position in Planetary Atmospheres. Applications are invited for postdoctoral research positions at the Lunar and Planetary Laboratory, University of Arizona, in Tucson, Arizona. The two positions will involve research in planetary physics and analysis of UV data from the Voyager mission. Research opportunities for these positions include the bound and extended atmospheres and ionospheres of the giant planets and their satellites, the Io plasma torus, earth's atmospheres, the interstellar medium, and the atmosphere and ionosphere of Venus. Applicants should have a strong background in theory and data analysis. Physicists and astronomers are encouraged to apply. Curriculum Vitae, bibliography and three letters of reference should be sent by March 1, 1984 to Dr. A. L. Broadfoot, Lunar and Planetary Laboratory, University of Arizona, 3625 E. Ajo Way, Tucson, Arizona 85713.

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Igneous/Metamorphic Petrologist-Oregon State University. This is a new faculty position, 12-month appointment, tenure-track. Candidate is expected to develop a strong research program, applying theoretical, experimental, and/or latest analytical methods to petrological problems, particularly those related to the origin and evolution of oceanic crust, islands, and/or volcanic arcs. Research experience with one of the following is desirable: XRF, XRD, stable isotopes (C, N, S), solid source mass spectrometry (Sr, Pb, Nd). Rank is Assistant/Associate Professor. Salary is $27,000–$43,000, commensurate with experience. Send resume and names of three references by 1 March 1984 to:

G. Ross Heath, Dean
College of Oceanography
Oregon State University
Corvallis, OR 97331

Oregon State University, an Affirmative Action/Equal Opportunity Employer, complies with section 504 of the Rehabilitation Act of 1973.

Faculty Position in Geology/Hunter College. New York, N.Y. Hunter College, City University of New York. Fall 1984. Rank and salary open. Positions for an advanced or starting scientist to take an aggressive role in an expanding research program emphasizing geologic applications of remote sensing, mathematical modeling, statistical data analysis, and related quantitative areas. Research emphasis in geophysics or hydrogeology will be helpful, but not essential. Proven extramural funding ability is required for advanced level appointment. Experience with government, industry and foreign nations also helpful. Ph.D. required at time of appointment. Send vitae, publications, names of at least three referees to Dr. Alan H. Strahler, Hunter College, Dept. of Geology and Geography, 695 Park Avenue, New York, N.Y. 10021. Closing date March 1, 1984.

Equal Opportunity Employer.

Planetary Geologist/Brown University. Tenure track Assistant to Associate Professor position starting July 1, 1984, or as soon as possible thereafter to teach and conduct research in planetary geologic processes on Earth and other planets. Research should be on understanding the physical processes (for example, impact cratering, volcanism, tectonism) responsible for the origin of planetary surfaces. Applicants must have Ph.D. in planetology, geophysics or geology. Deadline for applications is March 1, 1984. Interested parties should send vita and names of at least three persons we may contact for recommendations to: M. J. Rutherford, Chairman, Department of Geological Sciences, Brown University, Providence, RI 02912.

An equal opportunity/affirmative action employer.

University of Arkansas/Tenure-Track Position—Structural Geology. Applications are invited for a tenure-track position in structural geology/tectonics, beginning August, 1984. The Ph.D. is required. Candidates who will strengthen our anticipated Ph.D. program with research interests in field-oriented studies of rock deformation, rock fabrics (or metamorphism), or the tectonics of active margins which would complement growing programs in geophysics, sedimentation, and petrology are encouraged to apply. The successful applicant will direct graduate research and maintain this program with outside funding as well as teach undergraduate and graduate courses in structural geology and tectonics, an occasional course in Introductory geology, and provide some support for the Montana field camp. Rank and salary are open, depending upon experience and qualifications. Applicants should submit a resume and statement of teaching and research interests directly and arrange to have at least 3 letters of recommendation sent to Robert C. Morris, Department of Geology, University of Arkansas, Fayetteville, AR 72701. Phone 501-575-3355. Deadline for all material is March 31, 1984.

University of Arkansas is an equal-opportunity/affirmative action employer.

Senior Research Associate in Astrophysics/Lunar and Planetary Laboratory, University of Arizona. Applications are invited for a Senior Research Associate position in ultraviolet astronomy at the Lunar and Planetary laboratory, University of Arizona, in Tucson, Arizona. The position will involve the analysis of low resolution FUV and EUV stellar spectra obtained from the Ultraviolet Spectrometers on board the Voyager 1 and 2 spacecraft. Applicants are expected to have a doctoral degree and at least two years' experience in analysis of stellar data. A background in planetary atmospheres and familiarity with interactive computing are also desirable. Candidates should submit a letter of application with vita, bibliography and three letters of reference by January 30, 1984, to Dr. A. L. Broadfoot, Lunar and Planetary Laboratory, University of Arizona, 3625 E. Ajo Way, Tucson, Arizona 85713.

The University of Arizona is an equal opportunity employer.

Two Faculty Positions/University of Illinois. The Department of Atmospheric Sciences, University of Illinois at Urbana-Champaign has two openings for faculty positions effective Fall 1984. Applications are invited for the rank of either tenure track Assistant Professor or tenure level Associate Professor in Atmospheric Science. Applications are encouraged from individuals in all specialties of atmospheric (and oceanographic) sciences although preference will be given to those who specialize in the areas of climate dynamics, large-scale atmospheric modeling, and satellite meteorology. The prospective faculty member is expected to develop an active research program involving graduate students and to do a moderate amount of teaching of undergraduate and graduate course with the opportunity of developing courses in his/her specialized field. The salary will be commensurate with the candidate's experience.

A Ph.D. in meteorology, oceanography or other closely related field is required. Those interested should send a resume, a list of all publications and the names of three references before March 31, 1984 to:

Professor Yoshi Ogura, Head
Department of Atmospheric Sciences
University of Illinois
1101 West Springfield Avenue
Urbana, IL 61801
217-333-2192

The University of Illinois is an equal opportunity/affirmative action employer and invites applications from all qualified candidates.

University of Oklahoma/Electronics Instrumentation Specialist. The School of Geology and Geophysics is accepting applications for a full-time Electronics Instrumentation Specialist. Principal responsibilities will include maintenance, calibration and user instruction for a new, computer-automated Rigaku XRD-XRF system, and maintenance and repair of electronic components of other lab facilities in the School. Additional opportunities could include involvement in the University's electron microscopy lab (SEM and TEM), and the development of a Van de Graaff-PIXE analytical system in collaboration with O.U. physicists. Applicants should have a B.S. in Geology, Chemistry, or Electrical Engineering or equivalent in experience. Salary is commensurate with qualifications. Send curriculum vitae and names and addresses of three professional references to:

Dr. David London
School of Geology & Geophysics
University of Oklahoma
Norman, Oklahoma 73019

Deadline for applications is March 15, 1984.

The University of Oklahoma is an affirmative action/equal opportunity employer.

Postdoctoral Research Fellowships/Caltech. The Division of Geological & Planetary Sciences at the California Institute of Technology expects to offer postdoctoral research fellowships in one or more of the following areas: geology, geophysics, geochemistry, and planetary science. Interested persons are asked to contact Dr. Peter Wyllie, Division of Geological and Planetary Sciences, California Institute of Technology, Pasadena, CA 91125.

An equal opportunity/affirmative action employer.

Analytical Chemist-Geochemist/University of California. B.S. or M.S. level with sound basic knowledge of analytical techniques is sought to assist in a laboratory pursuing basic research in geochemistry, geochronology, and isotope geology. Training in methods of ion-exchange and mass spectrometry provided. Immediate opening. Position must be filled by March 1, 1984. Contact Dr. Donald J. DePaolo, Department of Earth and Space Sciences, University of California, Los Angeles, CA 90024.

The University of California is an equal opportunity/affirmative action employer.

Seagoing Science Officer/Research Assistant. Applications are invited for a position as Science Officer in Ship Operations at the College of Oceanography, Oregon State University. The following duties are to be performed, with the aid of one full-time assistant and a number of specialized technicians: (1) to provide the interface, both on land and at sea, between the Marine Facility and scientific project personnel carrying out shipboard research programs, and (2) to assume responsibility for the care of common-use equipment.

Approximately 240 days at sea are to be shared with the assistant. Qualifications include experience at sea, experience with electronics and computers, and a Bachelor's degree. Salary is $25,000/year plus $25/day sea pay. Start date is 1 March 1984. To apply, send resume with names and addresses and telephone numbers of three employment references by 31 January, 1984 to:

Ship Operations Office
College of Oceanography
Oregon State University
Corvallis, OR 97331

Oregon State University, an Affirmative Action/Equal Opportunity Employer, complies with Section 504 of the Rehabilitation Act of 1973.

Mineralogy-Petrology/University of Massachusetts. The Department of Geology and Geography invites applications for a Sabbatical leave replacement for the Fall, 1984, and Spring, 1985, semesters. Responsibilities will be to teach an undergraduate course in mineralogy one semester, petrology the other, plus one additional graduate course in the candidate's field of interest (preferably igneous petrology). The successful candidate is encouraged to conduct research, to make use of the Department's Regional Analytical Facility (microprobe, XRF, XRD, Lamm experimental laboratory), and to participate in the Connecticut Valley 5 College (University, Amherst, Smith, Mt. Holyoke, Hampshire) geoscience programs. Interested applicants (recent Ph.D. or mature researchers) should submit a comprehensive Vitae and the names of at least 3 referees by February 15, 1984 to: Professor S.A. Morse, Department of Geology and Geography, University of Massachusetts, Amherst, MA 01003.

UMass Amherst is an Affirmative Action Equal Opportunity Employer.

University of Colorado-Boulder—Tenure Track Position in Atmospheric Dynamics. The Department of Astrophysical, Planetary and Atmospheric Sciences (formerly Astro-Geophysics) invites applications for a tenure track faculty position in the field of atmospheric science. The successful applicant must have a Ph.D. degree and should possess a strong background in geophysical fluid dynamics or dynamic meteorology, preferably in modeling large-scale terrestrial and/or planetary circulations. The appointment will be at the assistant professor level (although the associate professor level is not ruled out) and will begin August 20, 1984.

Applicants should have a strong commitment to research and to teaching at the graduate and undergraduate level. The opportunity will exist for a formal association with the Laboratory for Atmospheric and Space Physics, which has ongoing programs of space observations of planetary atmospheres.

To apply, please send a curriculum vita and the names and addresses of three references to:

Professor Gary E. Thomas
Department of Astrophysical, Planetary and Atmospheric Sciences
Campus Box 391
University of Colorado
Boulder, CO 80309
Telephone: 303-492-8913.

Salary: $24,000 minimum.

Application deadline: Postmarked no later than March 15, 1984 (Late applications will be accepted if the position is not filled).

The University of Colorado is an equal opportunity/affirmative action employer.

Visiting Professorship: Meteorology. August 16, 1984 to June 15, 1985. Some variation of these dates is possible. Excellent opportunity for individual who desires to do research while teaching a very light load in the field of his expertise. The U.S. Naval Academy, located in Historic Annapolis on the shore of beautiful Chesapeake Bay, is near Washington, D.C. and Baltimore, MD. Salary commensurate with applicant's background. Considerable latitude of action exists in travel, publishing, etc. Within limitations funding for travel is available. Earned Ph.D required. Please send resume and list of publications together with the names and addresses of three references to: Professor John F. Hoffman, Chairman, Faculty Search Committee, Oceanography Department, U.S. Naval Academy, Annapolis, MD 21402. Closing date: January 31, 1984.
An equal opportunity employer.

University of Wisconsin-Madison/Tenure Track Position. The Department of Geology and Geophysics invites applications for an anticipated tenure-track position at the assistant-professor level in applied geomorphology and hydrogeology commencing in August 1984. The applicant should be committed to developing a strong research program as well as teaching undergraduate courses in some aspects of engineering and environmental geology. The Ph.D. is required. Applicants with course work in engineering and an interest in the field application of geologic principles are especially encouraged to apply.
Send letter of application outlining your professional goals, transcripts, resume, copies of publications, and three letters of reference to Dr. David M. Mickelson, Department of Geology and Geophysics, Weeks Hall, University of Wisconsin, Madison, WI 53706.
The University of Wisconsin is an equal-opportunity/affirmative-action employer.

Center for Ocean-Land-Atmosphere Interactions/Department of Meteorology, University of Maryland, College Park, MD. The Department of Meteorology at the University of Maryland has established a center to study the interactions of ocean, atmosphere, and land processes and their impact on climate variability, and in particular to study the feasibility of dynamical prediction of short-term climate fluctuations. Applications are invited from qualified scientists to join the center at its inception. The center has openings for two partially state supported tenure line positions at Assistant/Associate Professor level, one Research Scientist, one Research Associate and three Faculty Research Assistants. Qualifications for these positions are described below.
1. *Assistant or Associate Professor:* One tenure line position for *Ocean Modeling*. The applicant should have good knowledge of oceanic and atmospheric dynamics, should also have the ability to develop ocean models and carry out research on variability and predictability of short term climate using coupled ocean-atmosphere models.
2. *Assistant or Associate Professor.* One tenure line position for *Atmospheric Predictability*. The applicant should have good knowledge of atmospheric dynamics and should have demonstrated his ability to carry out outstanding research on Geophysical Fluid Dynamics. Contributions to the study of atmospheric predictability using either simple models or complex GCMS, would be considered desirable.
3. *Assistant Research Scientist:* One non-tenure faculty position to be supported fully by the grant funds. The applicant should have demonstrated excellent knowledge of ground hydrology and interaction of vegetation and climate. Familiarity with application of land-surface process models in GCMs is desirable.

4. *Research Scientist:* One non-tenure faculty position to be supported fully by the grant funds. The applicant should have demonstrated excellent knowledge of atmospheric dynamics and general circulation of the atmosphere. Familiarity with the atmospheric GCMs is desirable but not essential.
5. *Research Associate:* One position for one year with possibility of extension for the second year. The applicant should be a recent Ph.D. with interest in studying the dynamics of quasi-stationary atmospheric anomalies either by analysis of observed data or by analysis of model simulations.
6. *Faculty Research Assistants:* Three positions (two modeling and one for data analysis). The applicants should have at least M.S. in Meteorology and demonstrated their ability to work with large models and high speed computers. They should also have good understanding of synoptic and dynamic meteorology, and familiarity with modern techniques of processing large volumes of data.
Letters of application should be sent to:

J. Shukla, Chairman
Search Committee
Department of Meteorology
University of Maryland
College Park, MD 20742.

Applications should include a curriculum vitae and names of three references.(Applications received before March 15, 1984, will receive full consideration.)
The University of Maryland subscribes to a policy of equal educational and employment opportunity. The University of Maryland, under Title IX of the Education Amendment of 1972, does not discriminate on the basis of sex in admission, treatment of students or employment.

University of Georgia/12-month tenure-track faculty appointment in the School of Forest Resources. Qualifications: Ph.D in hydrology or forest hydrology with at least one degree in forest resources. Background should include forest resource management and quantitative sciences. Responsibilities: Teach undergraduate and graduate level courses in forest hydrology and watershed management. Develop a research program in an appropriate area of forest hydrology. Rank: Assistant or Associate Professor, commensurate with qualifications. Salary: Commensurate with training and experience. Position available: July, 1984. Applications: All applications must be postmarked no later than 1 February 1984. Submit resume, transcripts, and names of at least three references to:

Klaus Steinbeck, Chairman
Hydrologist Search Committee
School of Forest Resources
University of Georgia
Athens, GA 30602
Telephone 404-542-1376

The University of Georgia is an Equal Opportunity/Affirmative Action Institution.

Summer Assistantships/National Astronomy and Ionosphere Center. NAIC will be conducting a Summer Student Program at the Arecibo Observatory in Puerto Rico. Areas of interest are Atmospheric Science, Planetary Radar Astronomy, Radio Astronomy, Electronics and Computer Science. The assistantships are normally for ten weeks with the starting date being flexible. Graduate students and undergraduates who have completed at least three years of undergraduate training as of next summer are eligible. Travel costs to and from Puerto Rico will be paid by NAIC. Application forms, which must be submitted by February 1, 1984, are available from the Office of the Director, NAIC, Space Sciences Building, Cornell University, Ithaca, New York 14853.
Cornell University is an equal opportunity/affirmative action employer.

Applied Geophysics/Bowling Green State University. The Department of Geology invites application for a tenure track, assistant professor position in Applied Geophysics to begin September 1984. Ph.D. required. The successful candidate will be expected to develop a research program in some aspect of Applied Geophysics and teach courses in Geophysics, Exploration Geophysics and in his or her specialty.
The Department has eleven fulltime faculties. In addition, two faculties from the Physics Department participate in our geophysics program. Complete geophysical instrumentation, including a seismograph station and rock mechanics lab, is available.
Interested persons should send resume, statement of research interests, official transcripts, and three letters of reference to: Charles M. Onasch, Chairman, Search Committee, Department of Geology, Bowling Green State University, Bowling Green, OH 43403.
The closing date is March 15, 1984.
BGSU is an equal opportunity/affirmative action employer.

University of Washington/Geophysics—Research Faculty Positions. Applications are invited for two or three openings for research faculty. Individuals are to establish innovative and high-quality research programs and to obtain funding to maintain those programs (including salaries). Candidates with interests in the following subfields are particularly encouraged to apply: seismologists with experience and interests in volcanic earthquakes and associated phenomena and glaciologists with experience in ice cap flow modeling or in avalanche mechanics. Send curriculum vitae and four letters of reference prior to 15 March to Professor Ronald T. Merrill, Geophysics Program AK-50, University of Washington, Seattle, WA 98195.
UW is an affirmative action/equal opportunity employer.

Mineralogist/Petrologist/Geochemist—South Dakota School of Mines. A position as Research Scientist I (research equivalent of assistant professor) is currently available in the Institute for the Study of Mineral Deposits (ISMD) at the South Dakota School of Mines and Technology, Rapid City, South Dakota. A Ph.D. degree in the general areas of mineralogy-petrology-geochemistry is required and the Ph.D. degree must be in hand before assuming the position with ISMD. The successful applicant will interact with the several research programs conducted by ISMD with special emphasis on the mineral deposits of the Black Hills, South Dakota. Major research responsibility will concern a long-term, in-depth study of strataform gold deposits in the Black Hills. ISMD has a fully automated (WDS + EDS) microprobe and a new state of the art automated atomic absorption spectrometer with inductively coupled plasma torch (AA/ICP) for major, minor and trace elements analysis. Arrangements are in place for neutron activation analysis (Battelle, Richland, Washington) and light stable isotope analysis (U.S.G.S.).
Candidates for the position should send resumes and three letters of recommendation to:

J.J. Papike, Director, ISMD
South Dakota School of Mines and Technology
500 East St. Joseph Street
Rapid City, South Dakota 57701–3995

For additional information, call (605) 394-6152.
SDSM&T is an affirmative-action/equal opportunity employer.

Faculty Positions: Physical, Biological, Geological, and Chemical Oceanography. Nova University's Oceanographic Center has vacancies at the faculty level in these disciplines. The applicant must have the Ph.D. degree in a related science and a demonstrated competence in his/her field. Limited teaching opportunities are available. The successful applicant is expected to obtain funding from sources outside the University by the end of the first year. By April 1, 1984, the applicant should send a resume and the names of three references to: Dr. Julian P. McCreary, Jr., Director, Nova University Oceanographic Center, 8000 N. Ocean Drive, Dania, FL 33004.
An affirmative action/equal opportunity employer.

Structural Geologist/University of Maryland. The Department of Geology, University of Maryland at College Park, seeks a structural geologist to fill a tenure track position at the Assistant Professor level by August, 1984. The applicant should have a commitment toward quality research and can contribute to a rapidly developing M.S. and Ph.D. program as well as an established undergraduate component. Teaching responsibility includes structural geology, tectonics, and applied geophysics.
The College Park campus is located in the Washington metropolitan area close to USGS, Carnegie Institute, Smithsonian Institution, Goddard Space Flight Center, NBS and U.S. Bureau of Mines. For full consideration, applicants possessing Ph.D. should send a curriculum vitae, three letters of reference, and a description of research to: Dr. Roger Nielsen, Search Committee Chairman, Department of Geology, University of Maryland, College Park, MD 20742, 301-454-3548.
An equal opportunity employer.

University of Hawaii/Marine Geophysics. Hawaii Institute of Geophysics and Department of Geology and Geophysics invite applications for existing and anticipated openings in Marine Geophysics. Applicant's specialty may be in the marine applications in any one or more of seismology, geomagnetism, gravity, heat flow, and physical volcanology. Our choice will be based mainly on the scientist's record of (1) investigations at sea of tectonic, igneous, sedimentary, or hydrothermal processes, on or below the sea floor, such as at ridgecrests, trenches, transform faults, slopes, and seamounts, and (2) abilities and interest to teach in geology and geophysics at introductory as well as at advanced levels. One position will be filled at the professor level if a sufficiently qualified scientist applies. Interested persons should send a statement of their research and teaching interests, a resume, a bibliography, and a list of three referees, before 15 February, 1984, to: Dr. Charles E. Helsley, Director, Hawaii Institute of Geophysics, University of Hawaii, 2525 Correa Road, Honolulu, HI 96822.
University of Hawaii is an Equal Opportunity/Affirmative Action employer and invites applications from, and nominees of, women and members of minority groups.

Geophysics-Tectonophysics/University of Wyoming. Applications are invited for a tenure track position at the Assistant Professor level in the Department of Geology and Geophysics. Candidates should have teaching and research interests in such areas as tectonophysics, thermal modeling and/or plate tectonics. The successful applicant will join an established Ph.D. level geophysics program. Duties will include teaching undergraduate and graduate level geophysics courses, and establishing a vigorous research program. Excellent opportunities exist for cooperation with mathematics; the Mathematics Department includes a strong numerical methods group with interests in geophysics. Send resume, transcripts and three letters of recommendation by January 15, 1984 to Peter N. Shive, Dept. of Geology/Geophysics, PO Box 3006, University of Wyoming, Laramie, WY 82071.
The University of Wyoming is an equal opportunity/affirmative action employer.

Oceanography/FSU. Assistant Professor in Marine Chemistry or Biogeochemistry, Chemical Sedimentology or Atmospheric Geochemistry. Applications invited for position starting with 1984–85 academic year. Contact by 1 March 1984: Chemical Oceanography Search Committee, Department of Oceanography, Florida State University, Tallahassee, FL 32306, Telephone: 904-644-6705.
We are an equal opportunity employer.

University of Iowa/Faculty Positions. The Department of Physics and Astronomy anticipates two openings for tenure-track assistant professors or visiting faculty at any level in August 1984. In exceptional cases a term or tenured appointment at the associate professor or professor level will be considered. Preference for one position will be given to an experimentalist in intermediate or high energy physics. Current research interests in the department are radio and optical astronomy and the following specialties in physics: atomic, condensed matter, elementary particle, laser, nuclear, plasma, and space physics. Faculty duties include undergraduate and graduate teaching, guidance of research students and personal research. Interested persons should submit a resume and a statement of research interests and arrange for three letters of recommendation to be sent to Search Committee, Department of Physics and Astronomy, The University of Iowa, Iowa City, IA 52242.
The University of Iowa is an equal opportunity/affirmative action employer.

Microprobe Technician/South Dakota School of Mines and Technology. Applications are invited for a position as microprobe technician for the Institute for the Study of Mineral Deposits. The microprobe is an ETEC (MAC-5) with 3 spectrometers with Krisel automation and a quantitative PGT energy dispersive system. The successful applicant will be responsible for the day-to-day operation of the instrument including maintenance and repair of hardware, development of software, routine analysis of minerals, and assistance to students. A background in electronics is required. Salary commensurate with experience and qualifications.
Applicants should send a resume and three letters of recommendation to J.J. Papike, Director, Institute for the Study of Mineral Deposits, South Dakota School of Mines and Technology, Rapid City, South Dakota 57701–3995. Closing date: March 31, 1984. For additional information, call (605) 394-6152.
SDSM&T is an affirmative-action/equal opportunity employer.

Arizona State University/Postdoctoral Research Associate. Thermodynamics of phase transitions, solid solutions, order-disorder, glasses and melts. Prof. A. Navrotsky, Dept. of Chemistry, Arizona State Univ., Tempe, AZ 85287. (602) 965-4241.
Arizona State University is an Equal Opportunity/Affirmative Action Employer.

Water Resources Engineer/Hydrologist: Faculty Position. A tenure track faculty position at the Assistant or Associate Professor level is available beginning Fall 1984 for a water resources engineer with specializations in hydrology. Applicants must have a Ph.D., and their research interests should encompass pollutant transport phenomena in the groundwater environment. Graduate teaching responsibilities will include courses in both surface and groundwater hydrology. A resume and names of three references should be sent by March 31, 1984 to: Dr. Francis A. DiGiano, Chairman Search Committee, Department of Environmental Sciences and Engineering, School of Public Health 201-H, University of North Carolina, Chapel Hill, NC 27514.
The University of North Carolina is an equal opportunity/affirmative action employer.

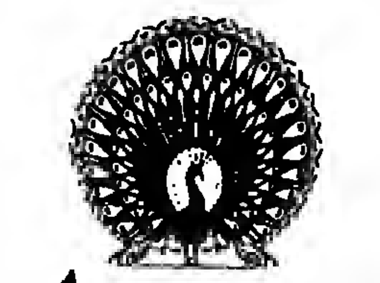
Microprobe Technician-Operator/University of Maine at Orono. Subject to budgetary approval, the Department of Geological Sciences at UMO will have this position available by February 1, 1984. Person appointed must be capable of bringing an automated MAC-400S probe on line as a routine instrument; also able to instruct students on its operation. Similar capabilities with a mass spectrometer highly desirable. Some geologic background preferred. Initial appointment for one year with likelihood of subsequent reappointment. Salary in the range of $17,000-$20,000/year. Apply to: C.V. Guidotti, Department of Geological Sciences, University of Maine at Orono, Orono, Maine 04469.
The University of Maine is an equal opportunity/affirmative action employer.

University of Toronto/Postdoctoral Position in Ore Deposits/Oceanography. A two or three year postdoctoral position is available immediately to study the geology and geochemistry of hydrothermal polymetallic sulfide deposits of the present-day ocean floor and their ancient analogues on land. The position will require field work on ore deposits and in the northeastern Pacific Ocean as well as occasional teaching in undergraduate and graduate courses. Preference may be given to candidates with research experience on ocean-floor polymetallic sulfides or ancient volcanogenic massive sulfide deposits and a willingness to learn about the other. Remuneration is at standard rates set by the Natural Sciences and Engineering Research Council of Canada (NSERC) which currently is $17,500 to $20,500 per year depending on experience.
Applications with resume and addresses of three referees should be sent to:

Dr. Steven D. Scott
Department of Geology
University of Toronto
Toronto, Ontario
Canada
M5S 1A1

University of Toronto is an equal opportunity/affirmative action employer.

Geophysicist Position/University of Colorado, Boulder. The Department of Geological Sciences, University of Colorado, Boulder, invites applications from geophysicists for appointment to a tenure track faculty position. Applicants' research interests should be in some aspects of crustal deformation, with emphasis on the use of modern geodetic techniques for the solution of geodynamics problems. The successful applicant will have opportunities for collaboration with strong research groups in the Cooperative Institute for Research in Environmental Sciences (CIRES) and the Joint Institute for Laboratory Astrophysics (JILA) of the University. This faculty member is expected to contribute to the undergraduate and graduate instructional programs by teaching courses in theoretical and/or applied geophysics, as well as assisting in the teaching of courses for non-science majors. The appointee is expected to maintain a vigorous research program, which will include the direction of graduate students in the geophysics program. Applicants must have received a Ph.D. degree and preference will be given to those with one or more years of productive post-doctoral experience. This position will be filled at the assistant professor level. The academic year salary range is $22,000 to $30,000.
The desired starting date is September 1, 1984. The closing date for applications is March 1, 1984. The application should include a complete curriculum vitae, with publication list and reprints of most important publications, and a statement of research and teaching interests. The applicant should arrange for four letters of reference to be sent directly to the Search Committee. Apply to: Geophysics Search Committee, Attention: Edith Ellis, Department of Geological Sciences, University of Colorado, Campus Box 250, Boulder, CO 80309.
The University of Colorado is an equal opportunity/affirmative action Section 504 employer.



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Geophysical Fluid Dynamicist/Aeronautical Research Associates of Princeton, Inc. A Princeton based research corporation has a challenging position open at the Ph.D. experience level in Geophysical Fluid Dynamics, Physical Oceanography, Meteorology, or Engineering with strong background in Computational Fluid Dynamics. The successful candidate will have demonstrated expertise in at least two of the following areas: Modeling of Current, Wave, and Sediment Transport in Coastal, Estuarine, and Shelf Waters; Development and Application of Three Dimensional Numerical Models of Oceanic or Atmospheric Phenomena of Meso- or Smaller Scale; Modeling of Turbulent Transport. We offer a creative work environment, excellent benefit package, and salary commensurate with experience. Send resume in complete confidence to: Alexandra Leone, Aeronautical Research Associates of Princeton, Inc., P.O. Box 2229, Princeton, NJ 08540.

An Equal Opportunity Affirmative Action Employer M/F.

Seismologist/Virginia Polytechnic Institute and State University. The Department of Geological Sciences at Virginia Tech invites applications for an additional tenure-track faculty appointment at the junior level in Reflection Seismology. Research facilities include a complete VIBROSEIS 48-channel seismic data acquisition system and a dedicated VAX 11/780 computer using DISCO/SIN DISCO software.

Applicants must demonstrate a strong research record; preference will be given to those with experience in the theoretical and observational aspects of reflection seismology. Faculty members are expected to teach at both the undergraduate and graduate levels, supervise M.S. and Ph.D. theses, and conduct an active research program.

Applicants should send a resume and the names and addresses of three referees to:

J.A. Snoke
Department of Geological Sciences
Virginia Tech
Blacksburg, VA 24061

The appointment will begin September 1984 and candidates are expected to have completed requirements for the Ph.D. by that time. The application deadline is March 15, 1984.

Virginia Tech is an equal opportunity/affirmative action employer.

Atmospheric Scientist/Radiophysicist—M.I.T. A scientist is required to join the staff of the Haystack Observatory, (operated by M.I.T. on behalf of the Northeast Radio Observatory Corporation) to conduct a program of experimental investigation into the dynamics of the troposphere and stratosphere. The work will be carried out at the adjacent Millstone Hill facility using a 150 ft. diameter steerable radar which can secure returns from clear air turbulence. The successful candidate will be expected to have a Ph.D. degree obtained for research conducted in a related field, and a demonstrated ability to carry out an experimental program entailing data acquisition, analysis and theoretical interpretation. Several years experience using high-power radar for research or conducting other experimental investigations into atmospheric dynamics would be particularly valuable. Contact Dr. J.V. Evans, Director, Haystack Observatory, Westford, Mass., with resumes and references.

M.I.T. is an Equal Opportunity/Affirmative Action Employer.

STUDENT OPPORTUNITIES

Graduate Research Assistantships in Geophysics/Michigan Technological University. Paleomagnetism - Research to determine the time of copper mineralization in the Portage Lake Lava Series using paleomagnetism. Applicant should have an interest and background in petrology.

Seismology—Microseismicity study along selected segments of the Keweenaw Rift. Interest in geophysics with background in geology.

Both assistantships: M.S. level, $5,250/academic year plus tuition, suitable summer stipend.

Contact: Professor Gordon Franti, Department of Geology and Geological Engineering, Michigan Technological University, Houghton, MI 49931. 906-487-2531.

Michigan Technological University is an equal opportunity educational institution/equal opportunity employer.

Opportunities for Graduate Studies in Atmospheric Science/Georgia Institute of Technology. Openings are available for outstanding individuals seeking an M.S. or Ph.D. degree in graduate studies in atmospheric sciences. For successful applicants, these positions include 12-month research assistantships with starting salaries ranging from $8,000 to $12,500/12 months, depending on the degree being sought and the student's qualifications. All tuition and fees are also covered by the Institute. Complete applications with supporting documentation should be received no later than March 15, 1984.

Interested students should write to

Dr. Douglas D. Davis
School of Geophysical Sciences
Georgia Institute of Technology
Atlanta, GA 30332.

AGU

Special Issue in JGR–B

The *Journal of Geophysical Research*, B, will publish a special issue in 1985 focusing on the results obtained using a variety of new seafloor mapping tools (e.g., SEA BEAM, SEA MARC I and II, GLORIA, GEOS-3 and Seasat radar altimetry). Liberal use of color and large-format black and white figures are encouraged. Special reduced rates for color will apply. The submission deadline is September 1, 1984; publication is planned for July or August 1985.

Papers describing results obtained using these new mapping techniques in a variety of tectonic environments (e.g., mid-ocean ridges, active margins, passive margins, seamounts) are solicited as well as papers describing instrumentation and data processing and interpretation techniques. For further information contact Gerald Schubert, Editor of JGR – B or Robert Detrick, Associate Editor for this volume, at the addresses below.

Gerald Shubert, Editor
Journal of Geophysical Research
Dept. of Earth & Space Sciences
University of California
Los Angeles, CA 90024
213-825-4577 or 824-5685

Robert S. Detrick
Graduate School of Oceanography
Narragansett Bay Campus
University of Rhode Island
Kingston, RI 02881

Meetings

1984 AGU Spring Meeting: Update

Abstracts must be received at AGU by 5 P.M. on February 22 to be on time. Late abstracts (1) may be summarily rejected by program chairman, (2) may not be published in advance of the meeting, and (3), if accepted, will be charged a $25 late fee in addition to the regular publication charge.

The 1984 Spring Meeting of the American Geophysical Union will be held in Cincinnati, May 14–18, at the Cincinnati Convention Exposition Center. Blocks of sleeping rooms are being held at the Clarion (formerly Stouffer's) and Netherlands hotels for those attending. Corresponding authors will be sent housing and registration forms. In addition, the forms will be published in a future issue of *Eos*.

General Regulations

- Abstracts may be rejected without consideration of their content if they are not received by the deadline or are not in the proper format. Abstracts may also be rejected if they contain material outside the scope of AGU activities or if they contain material already published or presented elsewhere. **Only one contributed paper by the same first author will be considered for presentation; additional papers (unless invited) will be rejected automatically.**
- Only AGU members may submit an abstract. The abstract of a nonmember must be accompanied by a membership application form (with payment) or it must be sponsored by an AGU member.
- There is a publication charge of $40 ($30 if prepaid) for each abstract. The publication charge is $20 if the first author is a student. Both invited and contributed papers are subject to the publication charge. Prepayment of the publication charge can save money. Send a check for $30 ($15 for students) with your abstract. The abstract must be received at AGU by February 22 to avoid an additional $25 charge. Abstracts not prepaid will be invoiced prior to the meeting. Payments will be accepted at the meeting.
- AGU will acknowledge receipt of all abstracts. Notification of acceptance and scheduling information will be mailed to corresponding authors in late March.

Abstracts

The abstract page is divided into two parts: the abstract itself and the submittal information. Follow the instructions for both carefully. Please use a carbon ribbon to type the material, and do not exceed the maximum dimensions (11.8 cm x 18 cm) of the abstract. **Abstracts that exceed the noted size limitations will be trimmed to conform.**

The meeting program will be prepared by photographing the abstracts exactly as they are received. Use the model abstract to prepare the final version. Submission of an abstract for an AGU meeting is presumed to carry with it permission for AGU to reproduce the abstract in all editions of *Eos* and in the programs and reports relating to the meeting. It is also presumed to permit the free copying of those abstracts. Although *Eos* is a copyrighted journal, authors are not requested to transfer copyright. Copyright, where it exists, will be reserved by the authors.

Submittal Information

Numbers refer to the items in the submittal block on the sample abstract.

1. Title of meeting.
2. Identification (only members may submit an abstract; this includes invited authors): Type the identification number of one member author (ID number is the line consisting of four letters followed by the six digits; see member's mailing label on *Eos* or journals), or if no author is an AGU member, type the ID number of the member sponsor (sponsor's name must also appear on the abstract at the end of the author portion). If no ID number is given, a membership application and dues payment must accompany the abstract. Call AGU immediately at 202-462-6903 if you need an application.
3. Corresponding address: Give complete address and phone number of author to whom all correspondence (acknowledgment and acceptance letters) should be sent. Abbreviate as much as possible.
4. Section (or theme) to which abstract is submitted (use the following letter abbreviations): A (Atmospheric Sciences); G (Geodesy); GD (Geodynamics); GP (Geomagnetism and Paleomagnetism); H (Hydrology); O (Ocean Sciences); P (Planetology); S (Seismology); SA (Aeronomy); SM (Magnetospheric Physics); SC (Cosmic Rays); SS (Solar and Interplanetary Physics); T (Tectonophysics); V (Volcanology, Geochemistry, and Petrology); U (Union); Mineral Physics (submit to T or V, as appropriate, noting mineral physics as special session).
5. Type title of special session (if any) to which submittal is made.
6. Indicate your preference for a particular kind of presentation by one of the following letters: O, oral; P, poster; T, tide. The chairman may assign you to one of these types of presentation in order to fit his program plan.
7. Percent of material previously presented or published, and where.
8. Billing information.

(*a*) Complete billing address if other than the corresponding address (item 3 above).

(*b*) If purchase order is to be issued, indicate number upon submittal of abstract. Invoices returned to AGU because of insufficient billing information will be assessed an additional charge of $10.

(*c*) If a student member is the first author, the student publication rate is applicable. Type "student rate applicable."

(*d*) If prepaid, enter amount enclosed.

9. Indicate whether paper is C (contributed) or I (Invited). If invited, list name of inviter.

Poster Sessions

A large, centrally located meeting room will be set up for poster presentations. Experience from AGU meetings and from other scientific societies has shown that a poster presentation, while more demanding of the author, can provide a superb opportunity for comprehensive discussions of research results. Some sections are organizing poster sessions on specific topics, and contributed papers on these subjects will automatically be scheduled as posters. In other sections it may be necessary to assign papers to poster sessions even though their authors requested oral presentation.

Presenters of poster papers are reminded that a poster exhibit requires careful preparation. Figures and text should be scrutinized in detail, and authors must be prepared to discuss the contents of their papers in depth. Under these conditions, well-prepared figures and concise, logical text are essential.

Program Committee

Meeting Chairman and Union (U) H. Frank Eden, NSF
Atmospheric Sciences (A) Ronald Lavoie, NOAA
Geodesy (G) Demos Christodoulidis, NASA/GSFC
Geodynamics (GD) Louis S. Walters, NASA Hq.
Geomagnetism and Paleomagnetism (GP) Patrick Taylor, NASA/GSFC
Hydrology (H) John R. Ritter, USGS, Harrisburg, Pa.
Ocean Sciences (O) Robert L. Molinari, AOML/NOAA
Planetology (P) Carle M. Pieters, Brown University
Seismology (S) Emile Okal, Yale University
SPR: Aeronomy (SA) Raymond G. Roble, NCAR
SPR: Cosmic Rays and Solar and Interplanetary Physics (SG/SS) Miriam A. Forman, SUNY, Stony Brook (SG); Bruce T. Tsurutani, Jet Propulsion Laboratory (SS)
SPR: Magnetospheric Physics (SM) Michael Schulz, Aerospace Corp.
Tectonophysics (T) Mark Parmentier, Brown University
Volcanology, Geochemistry, and Petrology (V) Peter W. Lipman, USGS, Denver

Special Sessions

New special sessions are indicated by an asterisk.

Atmospheric Sciences

Acid Precipitation
Meteorology and Atmospheric Chemistry of the Polar Regions

Geodesy

*Trends in Geodesy
*Development and Application of Global and Regional Geodetic Datums
*Interdisciplinary Research in Geodesy and Tectonophysics
*Excitations of the Earth's Rotation(U)

Geomagnetism and Paleomagnetism

Rock Magnetism
Geomagnetic Methods Applied to Economic Resources
Magnetic Anomaly Studies and the Structure of the Sea Floor
Magnetic Polarity Stratigraphy and Time Scales
Irregularities in the Secular Variations and Geodynamic Implications (G)

Hydrology

Symposium on Miscible and Immiscible Transport in Groundwater
Symposium on Field Methods for Supporting Groundwater Chemical Transport Models
Measurement of Groundwater Transport Parameters
*Hillslope Hydrology
*Geochemistry/Water Quality of Catchments (Cosponsored by V)
*Sediment Storage in Rivers and Estuaries

Ocean Sciences

El Niño: Biology and Chemistry
El Niño: Physical Characteristics
Gulf Stream Dynamics
Ocean Technology
Response of the Upper Ocean to Very Strong Winds
Inland Seas
Oceanography of Straits and Sills
Oceanic Sources of Atmospheric Trace Gases
Oceans Monitoring
Oceanographic Applications of EM Fields
*Pelagic Sedimentation: Geology and Geochemistry
*Gulf of Maine
*South Atlantic Oceanography
*Ocean Drilling: Past and Future
*Teleconnections (Cosponsored by A)

Planetology

Lower Crustal Processes

SPR: Aeronomy

*Modeling Ionospheric Processes (Poster Session)
*Upper Atmospheric Waves and Instabilities
*Middle Atmosphere Transport Processes

SPR: Cosmic Rays and Solar and Interplanetary Physics

New Techniques and Applications of Geomagnetic Effects in Cosmic Rays Studies
*New Observations and Theories in Solar Flare Particle Acceleration
*Displays of Energetic Solar Phenomena (Poster Session)
*Recent Advances and Future Directions of Solar Observations
*Solar Physics and Plans for Future Solar Observations (Poster Session)

SPR: Magnetospheric Physics

Aurora and Substorms (Poster Session)
Geomagnetic Pulsations
Ionosphere and Plasmasphere

Geomagnetic Tail and Boundary Layer (Poster Session)
Magnetospheric Currents and Electric Fields (Poster Session)
Numerical Simulation of Space Plasmas (Poster Session)
Waves, Instabilities, and Turbulence in Space Plasmas (Poster Session)

Tectonophysics

*Large Scale Continental Extension
*Development in High Pressure/High Temperature Research: A Tribute to John C. Jamieson
*Role of Point Defects in the Mantle and Lower Crust
*Ductile Shear Zones: Mechanisms and Process
*Observational Constraints on Mantle Convection (Cosponsored by S)

Other Themes

Geodynamics

Primarily designed as the annual review of the research activities of the NASA Geodynamics Program, the geodynamics sessions will also incorporate appropriate contributed papers of a multidisciplinary nature in areas such as space-related aspects of geodesy, plate tectonics and polar motion, tectonics, body physics, and geopotential fields. All sessions in geodynamics will be sponsored by the Geodesy and/or Tectonophysics sections.

Mineral Physics

If one of the following fields is covered in the broadest sense, regardless of the section to which your paper is submitted, please add on your abstract, under number 4 of the submittal information, the phrase "For Mineral Physics Session," and one of the following fields: (1) physical measurements on minerals, (2) calorimetry, (3) high-pressure mineralogy, (4) defect structure studies, (5) mineral and solids equations of state, (6) quantum mechanics of solids, (7) spectral mineralogy, or (8) electrical measurements on minerals.

For actual size, see *Eos*, November 15, 1983, p. 937.

Sample Abstract

11.8 cm

<u>Technique for the Preparation of Abstracts</u>

F. R. S. T. AUTHOR (School of Oceanography, Hydro University, Watertown, Mass. 02172)
<u>S. C. N. D. AUTHOR</u> (USGS, Woods Hole, Mass. 02543)
(Sponsor: I. C. Alvin)

Follow this example in typing the abstract. The printing plates will be prepared by photographing the abstracts <u>exactly</u> as they are received, except that abstracts exceeding the maximum length (18 cm) or width (11.8 cm) will be cut to conform.

Use a good typewriter with a ribbon in good condition. A carbon ribbon gives the best results. Please use type of about this size. Use 12 pitch. There will be a reduction of 50% for the printed abstract volume.

Follow these guidelines:

(1) Type title in capital and lower case letters except where all capitals are standard. Underscore entire title.
(2) Leave one line blank after title.
(3) Type names of authors in all capital letters, with affiliation and address in capital and lower case letters. Do not leave blank lines between authors.
(4) <u>Underscore</u> the name of author who will present paper.
(5) If no author is a member of a cosponsor society, type sponsor's name in capital and lower case letters.
(6) Leave one blank line after author block.
(7) Neatly drawn in symbols or Greek letters are acceptable. Use India ink.
(8) Use SI units.

18 cm

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Submittal Information

(See explanation)

1. Spring Meeting
2. AUTH0012345
   or
   ALVI012345 (Sponsor)
3. (a). Corresponding address:
   S.C.N.D. Author
   MS 123
   USGS
   Woods Hole, MA 02543
   (b). Telephone number
   617-548-1235
4. O (Ocean Sciences)
5. Special Session:
   XXXXXX
   (or none)
6. P (Poster)
7. 10% at Midwest Meeting
8. (a). Hydro Univ.
   Accounting Dept.
   Admin. Bldg.
   Watertown, MA 02172
   (b). P.O. XX684710
   (c). Student rate applicable
   (d). If prepaid enter amount enclosed. (U.C.'s requiring invoicing are not eligible for discount rate).
9. C (Contributed)

Abstract Deadline February 22, 1984

Mail original and two copies to:

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American Geophysical Union
2000 Florida Avenue, N.W.
Washington, DC 20009

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Separates

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Exploration Geophysics

0920 Magnetic and electrical methods
EFFECT OF WELL CASINGS ON SURFACE ELECTRICAL SURVEY
J. Scott Holladay (Department of Physics, Geophysics Laboratory, University of Toronto, Toronto, Ont., Canada M5S 1A7) G. F. West

Surface electrical surveys are being used as alternative oil exploration tools in both developed and frontier areas. We have examined the resistivity-IP response of steel oil well casings, which are common in developed oil fields. Two numerical models were constructed: a solution of Laplace's equation in the spatial wavenumber domain, and an integral equation approach using the Galerkin weighted residual technique, which simulate hollow, infinite-length cylinders and infinite-length cylindrical shells, respectively, embedded in a uniform half-space. Induced-polarization effects can be simulated in these models by including a complex, frequency-dependent surface impedance on the outer surface of the cylinder. Significant anomalies are generated by pipes having physically realistic dimensions and conductivities. Important parameters governing the response are the longitudinal conductance, length and radius of the pipe, and the number of pipes and their distances from the survey line. Comparisons of field data with model results suggests that a significant part of the observed response may be due to well casings. However, more complicated models including electrical connections at the surface and earth layering are required before accurate modeling of many situations will be possible.
GEOPHYSICS, VOL. 49, NO. 2

Hydrology

3194 Miscellaneous (Fluvial Geomorphology)
CHANNEL NETWORKS: A GEOMORPHOLOGICAL PERSPECTIVE
A. D. Abrahams (Department of Geography, State University of New York at Buffalo, Buffalo, New York, 14260),

The study of channel networks has been dominated since 1966 by the random model. However, recent work has shown (1) that although the topological properties of small networks conform to the random model more closely than those of large ones, even small networks exhibit systematic deviations from topological randomness, and (2) that the topological and length properties of channel networks are controlled to a large degree by the spatial requirements of subbasins and the need for these subbasins to fit together in space, by the size, elongation and migration rate of valley heads, and by the length and steepness of valley sides. The evolution of channel networks has been investigated by a variety of methods, including the development of conceptual and simulation models, the monitoring of small-scale badland and experimental drainage basins, and the substitution of space for time. The morphology of most channel networks is largely inherited from the past or strongly influenced by inherited forms. Inasmuch as there is no way of fully knowing the origin or complex history of such networks, the use of stochastic models in their study seems unavoidable. (Channel networks, drainage basins, geomorphology).
Water Resour. Res., Paper 3W1755

3199 General (Stochastic Differential Equations)
NUMERICAL INTEGRATION OF STOCHASTIC DIFFERENTIAL EQUATIONS IN CATCHMENT MODELING
T.E. Unny (Civil Engineering, University of Waterloo, Waterloo, Ontario, Canada, N2L 3G1)

The paper discusses appropriate integration procedure for deriving solutions to Stochastic Differential Equations (SDE's). Such SDE's have been suggested as models for the generation of stochastic streamflows from catchments. The SDE's have been developed by expanding the Nash Cascade to include stochastic inputs of rainfall and catchment abstractions. The numerical integration of the SDE's provide sample functions that can be considered as representations of streamflows. An important result is that the integration procedure should be carefully chosen to agree with the definition of the SDE as an Ito SDE or a Stratonovich SDE. (Stochastic Differential Equation, Ito equation, Stratonovich Equation, Nash cascade).
Water Resour. Res., Paper 3W1777